<RRH>Introducing Registered Reports

<ArtType>EDITORIAL

<AT>Introducing Registered Reports at *Language Learning*: Promoting Transparency, Replication, and a Synthetic Ethic in the Language Sciences

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<AN>Marsden and Morgan-Short are co-first authors. The two featured articles accompanying this editorial—a narrative and systematic review of replication research in second language research (Marsden, Morgan-Short, Thompson, & Abugaber, 2018) and a large-scale multisite replication project (Morgan-Short, Marsden, Heil, et al., 2018)—are published with permission from the board of directors of *Language Learning*. The multisite replication project was supported through a *Language Learning* research grant to Marsden and Morgan-Short. This financial support was applied for and received before Marsden and Morgan-Short joined the editorial team of *Language Learning.*

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The past few years have seen growing interest in open science practices, which include initiatives to increase transparency in research methods, data collection, and analysis; enhance accessibility to data and materials; and improve the dissemination of findings to broader audiences. *Language Learning* is enhancing its participation in the open science movement by launching Registered Reports as an article category as of January 1, 2018. Registered Reports allow authors to submit the conceptual justifications and the full method and analysis protocol of their study to peer review prior to data collection. High-quality submissions then receive provisional, in-principle acceptance. Provided that data collection, analyses, and reporting follow the proposed and accepted methodology and analysis protocols, the article is subsequently publishable whatever the findings. We outline key concerns leading to the development of Registered Reports, describe its core features, and discuss some of its benefits and weaknesses.

<KWG>Keywords open science; registered report; preregistration; transparency; replication; peer review; publication bias

<A>Introduction

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Open science, with its various initiatives aimed at enhancing transparency in research methods, observation, data collection, data access, and communication of findings, provides important mechanisms for enhancing the validity, credibility, and reliability of scientific endeavors. Over recent years, *Language Learning* has been promoting several open science practices, for example, by requiring the reporting of effect sizes (Ellis, 2000); encouraging authors to make materials and data fully transparent by holding them in a publicly accessible repository, such as IRIS (Marsden, Mackey, & Plonsky, 2016; https://www.iris-database.org) or other publicly accessible databases, including the Open Science Framework (OSF; https://osf.io) and Dataverse (https://dataverse.org); producing

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guidelines for transparent reporting of quantitative studies (Norris, Plonsky, Ross, & Schoonen, 2015); awarding Open Science badges to encourage authors to make materials and data available on a sustainable open repository and to preregister their studies (Trofimovich & Ellis, 2015); joining the Centre for Open Science preregistration award scheme in 2016 (https://cos.io/prereg); and promoting the IRIS Replication Award in 2017 (https://www.iris-database.org/iris/app/home/replication_award). The journal is continuing this trajectory with a new article category—Registered Reports. This initiative involves a simple but radical change in the research process that is designed to address many concerns and observed weaknesses in research and publication practices. Our goals in this editorial are to (a) outline the key issues that led to the introduction of Registered Reports at *Language Learning*, (b) describe the core features of Registered Reports, (c) highlight the benefits of Registered Reports, and (d) discuss some potential concerns surrounding this new approach to conducting and publishing research.

<A>Observed Problems in Research and Publication Practices

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Key concerns underpinning the launch of Registered Reports include (a) the related issues of a low rate of replication research (Marsden, Morgan-Short, Thompson, & Abugaber, 2018) and small sample sizes in published research (Norris et al., 2015), (b) "questionable research practices" (Chambers, 2017), and (c) more general challenges to the peer review process.

<B>Insufficient Rates of Replication Research and Small Data Sets

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The worryingly low number of published replication studies has weakened our confidence in the reproducibility and reliability of scientific findings, not only in the language sciences but also across many other disciplines. This lack of replication is particularly concerning for quantitative research

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that aspires to generalizations from small sample sizes (Plonsky, 2014). We briefly discuss two approaches to addressing this combined problem of small data sets and lack of replication, both of which set the scene for the introduction of Registered Reports at *Language Learning*. First, although technological developments (such as platforms to support preregistration, open materials, data, and software) facilitate large, multisite replication projects that involve large data sets (e.g., Morgan-Short, Marsden, Heil, et al., 2018), the perceived extra effort these approaches require can deter researchers, especially given the lack of assurance of eventual publication. Second, small samples in human participant research may be unavoidable due to the limited resources available to many researchers. Indeed, in the language sciences, it may not be desirable or possible to insist on larger samples while we are concurrently striving to expand participant demographics to hard-to-reach populations and to acknowledge the context sensitivity of language data (e.g., Berez-Kroeker et al., 2017; Ortega, 2012).[AU: Please provide a complete reference entry for Ortega, 2012.]

Small data sets are less problematic under a more synthetic research ethic, where replications are synthesized in primary research that combines new data with previous data sets via meta-analysis (e.g., Ellis & Sagarra, 2011; Morgan-Short et al., 2018). In actuality, however, meta-analyses are frequently secondary in that they synthesize previously published studies (Plonsky & Brown, 2015). And yet the large amount of heterogeneity between the sampled studies often leads to difficulties in producing useful or valid meta-analytic work. Unfortunately, to date, a high-quality synthetic ethic, which is necessary both for a rich source of closely related primary studies to feed into secondary meta-analyses and for the open, collaborative environment essential for primary meta-analyses, has been relatively rare in the language sciences. To illustrate, in the domain of second language research, Marsden et al. (2018) reported fewer than one self-labeled replication study in every 400 journal articles. They also noted an absence of direct replications and a great deal of heterogeneity (often unacknowledged or unjustified by the research aims) between self-labeled replications and the studies they replicated, which undermines comparisons between studies. Perhaps more worryingly for a

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synthetic ethic to research is that many studies do not self-label as replications, making it difficult to ascertain methodological and analytic similarities between studies that address similar questions.

So, what lies behind this dearth of published, self-labeled replication research? We mention here just four issues relevant to the introduction of Registered Reports at *Language Learning*. First, one likely reason for the low rates of replication research is a concern (warranted or not) that, due to unfavourable reviews, a replication study will not be published if it does not reproduce the initial study's findings. As a consequence, many replication studies are confined by the researchers to the file drawer. A second potential reason for the low amount and, arguably, the low validity of replication research is the very poor availability of materials. For example, Derrick (2016) reported that only 17% of research materials were available within published articles or online sources, and Marsden, Thompson, and Plonsky (in press) found that 27% were available. This means that future researchers wishing to systematically extend prior studies must either recreate materials, thus introducing unplanned heterogeneity, or work directly with the initial study's authors, thus introducing potential bias.

A third problem that impedes high-quality replication research is the very poor availability of raw data, as discussed by Larson-Hall and Plonsky (2015), which likely affects the quality of the research itself (Wicherts, Bakker, & Molenaar, 2011). This prevents replication researchers from validating previous analyses to ascertain the reproducibility of the findings and blocks researchers from combining their own data with previous data sets. Marsden et al. (2018) found a near complete absence of such research (see also Berez-Kroeker et al., 2017). A final impediment to replication research is a perception, at many levels, that replication research has low impact and prestige, although Marsden et al. illustrate that, in fact, self-labeled replications have been relatively very well cited and published by journals with high impact factors. In sum, despite multiple calls for increased

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replication research (e.g., Polio & Gass, 1997; Porte, 2012), cultural and structural issues such as these may have systematically hindered replication efforts.

<B>Questionable Research Practices

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A broader group of methodological concerns, fitting under the broad banner of questionable research practices (Chambers, 2017), have also been raised, again across many disciplines and particularly those that rely heavily on null hypothesis significance testing. One such practice is *p* hacking, which refers to testing more participants until a *p* value is achieved that is deemed to be statistically significant or to applying various data elimination criteria and presenting only the one that leads to a statistically significant result. Another such practice is known as HARKing (hypothesizing after results are known), where exploratory analyses are presented as if they were confirmatory, thereby implying an unwarranted theoretical kudos and so presenting findings with a level of confidence that may not be as reproducible as inferred by the article's argumentation. Although these practices may be common and not intentionally deceptive, they pose systematic challenges to the validity, reliability, and reproducibility of research findings (see similar arguments by Nosek, Ebersole, DeHaven, & Mellor, 2017).

<B>Challenges of Peer Review

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Finally, there are significant concerns about publication practices themselves. Of key significance is the well-attested phenomenon of publication bias, whereby authors tend to submit, and journals tend to publish, findings that show statistical significance or align with the outcome that is perceived as being more exciting. Another more general but very real challenge in many researchers' experience concerns protracted review timelines that can often end in rejection on the basis of methodological flaws that cannot be addressed after the data are collected. This challenge leads to a costly investment

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for researchers and reviewers alike, and it impacts the overall rate of scientific progress. In fact, one of the more frequent requests that reviewers make is for greater methodological clarity (e.g., DeKeyser & Schoonen, 2007), a problem that would be almost entirely addressed by making full materials and protocols available to the review process.

<A>Registered Reports

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First introduced at *Cortex* in 2013 (Chambers, 2013), Registered Reports were developed as a new article type to address at least some of these concerns (Chambers, Feredoes, Muthukumaraswamy, & Etchells, 2014, Nosek & Lakens, 2014; for more information, see https://cos.io/rr). Registered Reports are characterized by two core elements. First, a manuscript with a justification for the study and a full methods protocol receives peer review and, possibly, in-principle acceptance (IPA) before data collection commences. Second, IPA cannot be revoked based on the outcomes of the study, after the data have been collected. In order to implement these two core elements of Registered Reports, their submission and review have two distinct stages. In the first stage, the submitted manuscript includes an introduction to a question of interest, a review of literature to justify the study, the research questions and/or hypotheses that will be addressed, and the methods. The methods must detail the full protocol, namely, all materials, procedures, and planned analyses. Peer review of this initial manuscript addresses whether the research question(s) is/are justified and valuable and whether the proposed design, methods, and analyses are sound. At this stage, reviewers make suggestions, and authors respond with alterations to their manuscript. After review, the manuscript may receive IPA, meaning that the journal is committed to publishing the study—regardless of actual findings—as long as the methods and analyses are conducted according to the approved protocol. When a submission receives IPA, the stage-one manuscript is registered (held) internally with the journal. If authors wish, they can also hold their protocols with a publicly

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accessible and sustained filesharing service, such as IRIS (https://www.iris-database.org) and/or the OSF. In this case, authors can also opt to have the release date of the public registration embargoed, until, for example, after publication of the final manuscript. As soon as IPA is granted, data collection can begin.

The second stage of a registered article submission occurs when the data have been collected and analyzed (as per the registered protocol) and the results and discussion have been written. At this point, authors submit the full manuscript, including the stage-one manuscript plus the results and the discussion. The manuscript receives a second peer review to determine whether the study has been conducted and analyzed according to the approved protocol, whether the writing and presentation of results are acceptable, and whether claims made in the discussion are reasonable. Importantly, additional, exploratory analyses can be included in the stage-two submission, as long as they are clearly labeled as going beyond the approved protocol. Reviewers cannot recommend rejecting a manuscript on the basis of the justification or methods that were accepted at stage one, though they can reject exploratory analyses if they are not deemed reasonable. If these quality assurances are met, the manuscript is fully accepted for publication.

As of the date of writing, 66 journals across multiple disciplines have established Registered Reports (for a list of participating journals, see https://cos.io/rr). Although all Registered Reports include the two core elements mentioned above, journals may vary their specific guidelines as appropriate for the field and aims of specific journals. Registered Reports at *Language Learning* were developed to be feasible for the broad area of language sciences and as amenable to different methodological approaches as possible. At *Language Learning*, Registered Reports follow the general flow described above, with specific author guidelines available at http://onlinelibrary.wiley.com/lang. In addition, *Language Learning* aims to incentivize submissions under the Registered Report category by giving preference to a Registered Report proposal for one

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of the annual Early Career Research Grants (available under Grant Programs at http://onlinelibrary.wiley.com/lang).

<B>Benefits of Registered Reports for Research and Publishing

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Registered Reports afford multiple benefits in each of the three main areas discussed above: (a) addressing general concerns about publication and peer-review processes; (b) promoting replication, transparency, and working synthetically across multiple samples and sites; and (c) reducing questionable research practices. In terms of addressing general concerns about publication processes, Registered Reports allow authors to gain valuable input from experts at the point that advice is needed and can be acted upon—before data collection. From the reviewers' point of view, their role is arguably more satisfying because reviewers have the opportunity to identify methodological flaws before data are gathered, and we understand that reviewers indeed find this more rewarding (C. Chambers, personal communication, January 16, 2017). A related benefit is that although some may believe Registered Reports extend the length of time required for publication, in actuality they typically shorten the overall research process. Stage-one review clearly adds time in the initial phase of the publication process. However, the stage-two review process is much quicker, compared to a regular review, and is more likely (though not guaranteed) to lead to a successful publication, as delays cannot be incurred due to the reviewers' evaluation of the perceived significance of the study or the quality of its methods. As DeKeyser and Schoonen (2007) noted, these have normally been among the major reasons for rejecting manuscripts. Further, even if a stage-one manuscript does not eventually receive IPA, a stage-one review may identify weaknesses that can be addressed, thus facilitating the future progress of the study. Ultimately, the Registered Report flow redistributes the time investment across different stages of the research process and likely shortens it, given that rejections and resubmissions often protract the long game of getting

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research published. Finally, perhaps the most obvious way in which Registered Reports improve general research practice is that they vastly reduce the opportunity for publication bias given that, after IPA, reviewers must be satisfied with the methods: Negative reviews motivated (even unconsciously) by null findings or by findings that are contradictory to a reviewer's expectations cannot affect the outcome of a review.

It is perhaps for this reason—the reduction of publication bias—that Registered Reports are known to promote the submission and publication of replication research (for a list of Registered Reports to date, see https://www.zotero.org/groups/479248/osf/items/collectionKey/KEJP68G9), likely because studies that do not reproduce previous findings cannot be rejected on the grounds of methodological weaknesses or (perceived) lack of fidelity to the previous study. Indeed, journals that offer Registered Reports as a route to publishing replication research meet the highest level (Level 3) of the Transparency and Openness Promotion guidelines about replication (Nosek et al., 2015). Thus, by facilitating replication, Registered Reports contribute to the wider aspirations of working with interconnected studies under a more synthetic ethic. Other side benefits of Registered Reports that also potentially serve to improve the quantity and quality of replication rest in the extra level of methodological transparency that this article type affords. The stage-one registered manuscript must include all materials and protocols, thus making them available to reviewers, and there is the eventual aim of publishing these materials and protocols alongside the final article (held in, for example, Supporting Information online). They can also be made openly available before data are collected so that researchers can conduct multisite replications, thus helping to address concerns about the small sample sizes of many individual studies. Regardless of whether this transparency is at the level of published transparency (i.e., behind a journal's paywall) or open transparency (i.e., on a sustainable open repository), this would represent a huge step toward enriching our collaborative effort, as well as improving our capacity for independent replication and validation. A final additional

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benefit of Registered Reports in terms of promoting replication is that citations of Registered Reports to date have been above the average for the journal they are published in (C. Chambers, personal communication, January 16, 2017), thus further allaying concerns that replications have low impact.

Finally, readers of Registered Reports are assured that the analyses carried out following the registered protocol have not been derived from strategies such as *p* hacking or HARKing. At a more extreme level, readers are also assured that data have not been faked or collected before stage-one submission, because the stage-one review process will almost always lead to some required changes to the materials and/or procedures, and thus any data collected prior to stage-one submission would be wasted. In addition, to demonstrate that the data have been collected after IPA, researchers submit date-stamped data files and, where appropriate, logs of the data collection process as specified in the registered protocol. Overall, readers of Registered Reports have confidence that the results are reported with careful attention to data and analysis integrity.

<B>Potential Concerns About Registered Reports

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In addition to offering researchers many benefits, particularly with respect to issues posing threats to research quality, Registered Reports could have some perceived weaknesses. One of the primary concerns is that by only following registered protocols, researchers would be limited to hypothesis testing rather than exploration and discovery (e.g., Goldin-Meadow, 2016a). However, Registered Reports certainly do permit the reporting of exploratory or serendipitous findings (Lindsay, Simons, & Lilienfeld, 2016) in a section clearly labeled as exploratory analyses. Importantly, this approach makes it clear which analyses were planned a priori as confirmatory analyses and which were carried out post hoc as exploratory analyses (Nosek et al., 2017; Wagenmakers, Wetzels, Borsboom, van der Maas, & Kievit, 2012).

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Another concern about Registered Reports is that if protocols, which include materials and procedures, are publicly registered prior to data collection, researchers who are not associated with the approved protocol may take the materials, run the study, and publish the results before the report is completed; that is, researchers could be scooped. This concern is easily addressed by having the journal itself hold the registered manuscript and protocols before the second-stage review, which is the approach implemented at *Language Learning*. However, in the spirit of open science, just as *Language Learning* encourages the sharing of materials and data, we encourage public registration. Again, even with this route, the concern about being scooped is easily addressed, as embargo dates can be set to release protocols to coincide with, for example, final publication of the article (e.g., see http://help.osf.io/m/registrations/l/524205-register-your-project).

Finally, there is a concern that Registered Reports might be only relevant to particular epistemological or methodological approaches. Indeed, in the development of Registered Reports, Chambers noted that Registered Reports are not applicable to all research approaches and are not intended to replace various other forms of inquiry (Chambers, 2013). Nonetheless, given that Registered Reports may be perceived as most easily accommodating certain types of studies, such as short-term laboratory research, the high value placed upon Registered Reports might inadvertently and undeservedly have the effect of "marginalizing studies for which preregistration is less fitting" (Goldin-Meadow, 2016b, p. 14). Registered Reports at *Language Learning* were developed to be as inclusive of different research approaches as possible. For example, there is no reason why a study with observational or interview data, a long-term design, or a naturalistic context could not be submitted as a registered manuscript. Critically, any study where at least some of the methods and analyses can be predetermined is open to registered submission. We certainly acknowledge, however, that Registered Reports are not applicable or desirable for all epistemologies. And we reiterate that Registered Reports do not replace current manuscript categories; rather, they

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constitute one approach to increasing methodological rigor and replication for some perspectives and methods in our field. As Goldin-Meadow (2016b) noted, we should continue "to think creatively about how to achieve robustness for the wide range of methods that comprise the richness of [our field]" (p. 14).

<A>Acknowledgments and Conclusion

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In working on the Registered Reports initiative, we have benefited tremendously from the advice by Chris Chambers (Cardiff University) and Daniel Simons (University of Illinois at Urbana-Champaign) as well as from Registered Report materials available through the OSF. We are most grateful for the technical, financial, and logistical support from Wiley-Blackwell and especially from Jenny Peng and Sara Bowman and their teams for enabling us to implement Registered Reports at *Language Learning*. We are proud that *Language Learning* is among the first journals in language sciences and the first journal in applied linguistics to introduce Registered Reports as an article category. The two featured articles accompanying this editorial—a narrative and systematic review of replication research in second language research (Marsden et al., 2018) and a Registered Report featuring a large-scale multisite replication project (Morgan-Short et al., 2018)—further discuss the benefits and challenges of promoting open science practices in language research and provide clear recommendations for the field. We hope that current and future *Language Learning* authors will avail themselves of this opportunity to engage in what we believe to be a cutting-edge opportunity to contribute to the open science movement while engaging in quality research in the language sciences. We intend to closely monitor the take-up and effectiveness of Registered Reports over the coming years. More generally, *Language Learning* continues in its efforts to promote methodological robustness in the language sciences by increasing research transparency, replication, and synthesis.

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